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A new species of *Graphis* (lichenized *Ascomycetes*) from South Korea

Yogesh Joshi[1], Robert Lücking[2], Yoshikazu Yamamoto[3], Xin Yu Wang[1], Young Jin Koh[1] & Jae-Seoun Hur[1*]

*yogesh36953@rediffmail.com & *jshur1@sunchon.ac.kr*
[1]Korean Lichen Research Institute, Sunchon National University
Sunchon 540-742, South Korea

rlucking@fieldmuseum.org
[2]Botany Department, The Field Museum
1400 South Lake Shore drive, Chicago Illinois 60605-2496, USA

yyamamoto@akita-pu.ac.jp
[3]Department of Bioproduction Science, Akita Prefectural University
Akita 010-0195, Japan

Abstract — *Graphis flavopalmicola* is described as a new lichenized fungus from Jeju Island (South Korea). It is characterized by smooth, whitish-gray, UV+ pale yellow thallus (lichexanthone), unbranched to irregularly branched lirellae; completely carbonized exciple, and transversely 5–9-septate ascospores. It differs from the closely related *G. palmicola* chiefly in its chemistry; the latter has no substances and is UV–.

Key words — biodiversity, *Graphidaceae,* lichens, *Ostropales,* taxonomy

Introduction

The lichen genus *Graphis* is characterized by a crustose thallus, rounded to lirellate or rarely pseudostromatic ascomata with carbonized exciples; non-amyloid, functionally unitunicate asci with apical wall thickenings, hyaline, amyloid ascospores with lens shaped lumina, and a trentepohlioid photobiont (Staiger 2002; Lücking 2009). The genus is represented by more than 300 species in the world (Kirk et al. 2008; Lücking et al. 2009). Recent molecular study has confirmed the placement of the genus *Graphis* within family *Graphidaceae* (Mangold et al. 2008).

In South Korea, this genus has so far been investigated to a limited extent with records of only nine species (Kim & Lee 1975; Kim 1976, 1981; Ka et

al. 1997; Park 1982; Hur et al. 2005). During the course of floristic surveys in the extreme southern part of South Korea (Jeju Island), an unknown species of *Graphis* was found growing over bark of *Abies* in open canopy forest. It resembled *G. palmicola* Makhija & Adaw. by having a smooth thallus, a completely carbonized exciple, transversely septate spores, and a similar geographical distribution. In this paper, *G. flavopalmicola* is described as new to science based on this specimen.

Materials and methods

The specimen for this study was collected on Jeju Island, situated in the extreme southern part of South Korea. The material is deposited in the herbarium of the Korean Lichen Research Institute (KoLRI). Description and photographs of external morphology are based on air-dried material observed under a dissecting stereomicroscope (Nikon SMZ645). Sections were made with a razor blade under the stereomicroscope and mounted in lactophenol cotton blue. Anatomical descriptions are based on these preparations under a compound microscope (Nikon Eclipse E200). Ten measurements per apothecial sections were recorded for ascospore dimensions. Iodine test was performed by using Lugol's solution. The chemistry of the specimens was studied with thin layer chromatography (Culberson 1972; Elix et al. 1987; Orange et al. 2001; White & James 1985) using solvents A and C, and high performance liquid chromatography (Yoshimura et al. 1994).

New species

Graphis flavopalmicola Y. Joshi, Lücking & Hur, **sp. nov.** Fig. 1

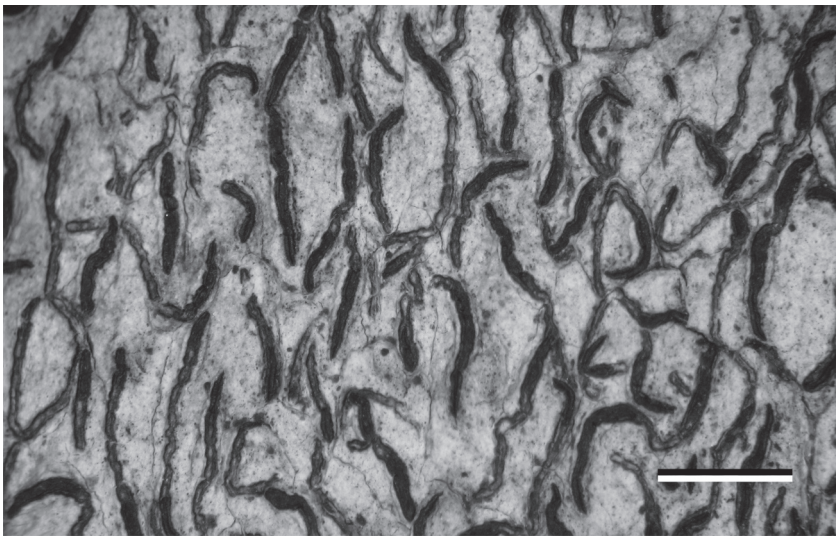
MycoBank MB 518424

Thallus crustaceus, epiperidermatis, continuus, tenuis, laevigatus vel ob substratum rugulosus, albus vel glauco-cinereus, opacus, UV+ flavescens. Ascomata lirellina, erumpentes, simplicia vel aniso-dichotomiter vel aniso-trichotomiter ramosa, flexuosa, usque ad 6 mm longa et 0.2 mm lata, apicibus acutus vel obtusus. Discus foramen, nigrus, epruinosus. Labia convergentia. Excipulum in toto carbonaceum. Hymenium non-inspersum. Paraphyses filiformes, simplices, densae, ad apicem modica clavatae et fulvescentes. Asci (4–)8-spori, ascosporae oblong-fusiformes, rectae, ad apicem rotundatae vel angustato-rotundatae, incolores, I+ caeruleo-violaceae, transversalibus 6–10 loculares, 20–25 µm longae et 4–7 µm latae.

Type — SOUTH KOREA, Jeju Island, Mt. Halla, N33°21'99.6", E126°32'15.1", alt. 1714 m, on *Abies* bark, 21 April 2009, Jae-Seoun Hur 090149 (**holotype**- KoLRI, isotype-KH).

Etymology — The species epithet refers to the UV+ yellow thallus and its resemblance to *G. palmicola.*

Description — Thallus crustose, epiperidermal, continuous, smooth to ± rugulose, 75–100 µm thick, with hyaline crystals scattered in the thallus, but



Habit of *Graphis flavopalmicola* (holotype). Scale = 4 mm.

mainly in clusters near the exciple; surface white or ash-gray, opaque. Soredia absent. Prothallus absent.

Apothecia much crowded, lirelliform, erumpent, unbranched to rarely anisotomic dichotomously or trichotomously branched, straight to ± flexuose, 1–6 mm long and 0.1–0.2 mm wide, terminally acute to obtuse. Disc exposed, black, epruinose (*handelii*-morph according to Lücking 2009). Thalline margin basal to lateral, but reaching the apices in some lirellae. Labia entire, convergent. Exciple basally closed, completely carbonized, dirty brown in thin sections, thalline margin with hyaline crystals. Epithecium indistinct, brownish, 5–7.5 µm. Hymenium hyaline, not inspersed, I–, 75–140 µm high. Paraphyses hyaline, filiform, unbranched, dense, 1–1.5 µm thick, moderately clavate and yellowish brown at apices. Ascospores (4–)8 per ascus, hyaline, transversely 5–9 septate, oblong-fusiform, straight, rounded to narrowly rounded at the apices, (19–)20–25(–27) × 4–7 µm.

Chemistry — Spot test reactions: thallus K– or yellowish-brown, C–, KC–, P–, UV+ pale yellow. TLC: lichexanthone. HPLC: unknown products at Rt 2.544 and 2.968.

Ecology and distribution — The species is so far known from the type locality and was found growing over the bark of *Abies koreana* at an elevation of 1714 m. The subalpine forest is mainly composed of *Abies koreana* community.

Remarks — *Graphis flavopalmicola* is characterized by smooth to rugulose, whitish-gray, UV+ pale yellow thallus, an exposed, blackish disc, entire labia, completely carbonized exciple, and small, transversely septate ascospores. In morphology of the ascomata and general appearance, the new species is most likely to be confused with *G. palmicola*, *G. assimilis* Nyl., and *G. stipitata* A.W. Archer. *Graphis palmicola* differs in having an UV– thallus. *Graphis assimilis* has larger ascospores [23–40(–54) µm] and produces norstictic acid (without lichexanthone), while *G. stipitata* differs in having a laterally carbonized exciple, slightly smaller ascospores (15–20 µm long), and the presence of norstictic acid in addition to lichexanthone.

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